ROSEBUD SYNCOAL PARTNERSHIP
SYNCOAL® DEMONSTRATION
TECHNOLOGY UPDATE

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SYNCOAL® PROCESS IMPROVES LOW-RANK COALS

An Advanced Coal Conversion Process (ACCP) technology being demonstrated in eastern Montana (USA) at the heart of one of the world's largest coal deposits is providing evidence that the molecular structure of low-rank coals can be altered successfully to produce a unique product for a variety of utility and industrial applications.

The product is called SynCoal® and the process has been developed by the Rosebud SynCoal Partnership (RSCP) through the U.S. Department of Energy's multi-million dollar Clean Coal Technology Program. RSCP is a Colorado (USA) general partnership formed for the purpose of conducting the Clean Coal Technology Program demonstration and the commercializing of the ACCP technology.

Western SynCoal Company, a subsidiary of Montana Power Company's Energy Supply Division, is the managing general partner of RSCP. The other general partner is Scoria Inc. a subsidiary of NRG Energy, the nonutility entity of Northern States Power Company of Minnesota (USA).

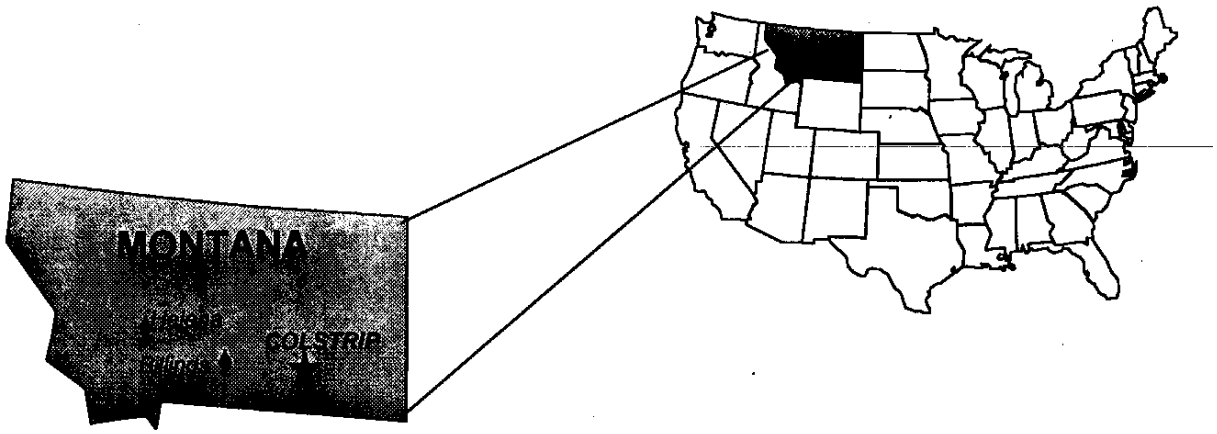
Montana Power Company's subsidiary, Western Energy Company, initially developed the ACCP technology and signed the original Cooperative Agreement with the Department of Energy (DOE) to build the demonstration facility under the Clean Coal Technology Program (CCT I). Western Energy then formed Western SynCoal Company and joined with Scoria. RSCP's partners own the technology in undivided interests and have exclusively licensed it to the partnership. The RSCP partnership manages the $105 million demonstration project adjacent to the Rosebud Mine at Colstrip, Montana and all activities related to technology commercialization. **(See Demo Plant Location Map)** DOE has committed $43.125 million in funding to the

demonstration project. Rosebud SynCoal is responsible for all additional funding and operation of the project.

The patented ACCP process improves the heating quality of low rank coals to produce an upgraded coal produced called SynCoal®, which is a registered trademark owned by RSCP.

ADVANCED COAL CONVERSION PROCESS

Demo Plant Location



Process

The ACCP demonstration process uses low-pressure, superheated gases to process coal in vibrating fluidized beds. Two vibratory fluidized processing stages are used to heat and convert the coal. This is followed by a water spray quench and a vibratory fluidized stage to cool the coal. Pneumatic separators remove the solid impurities from the dried coal.

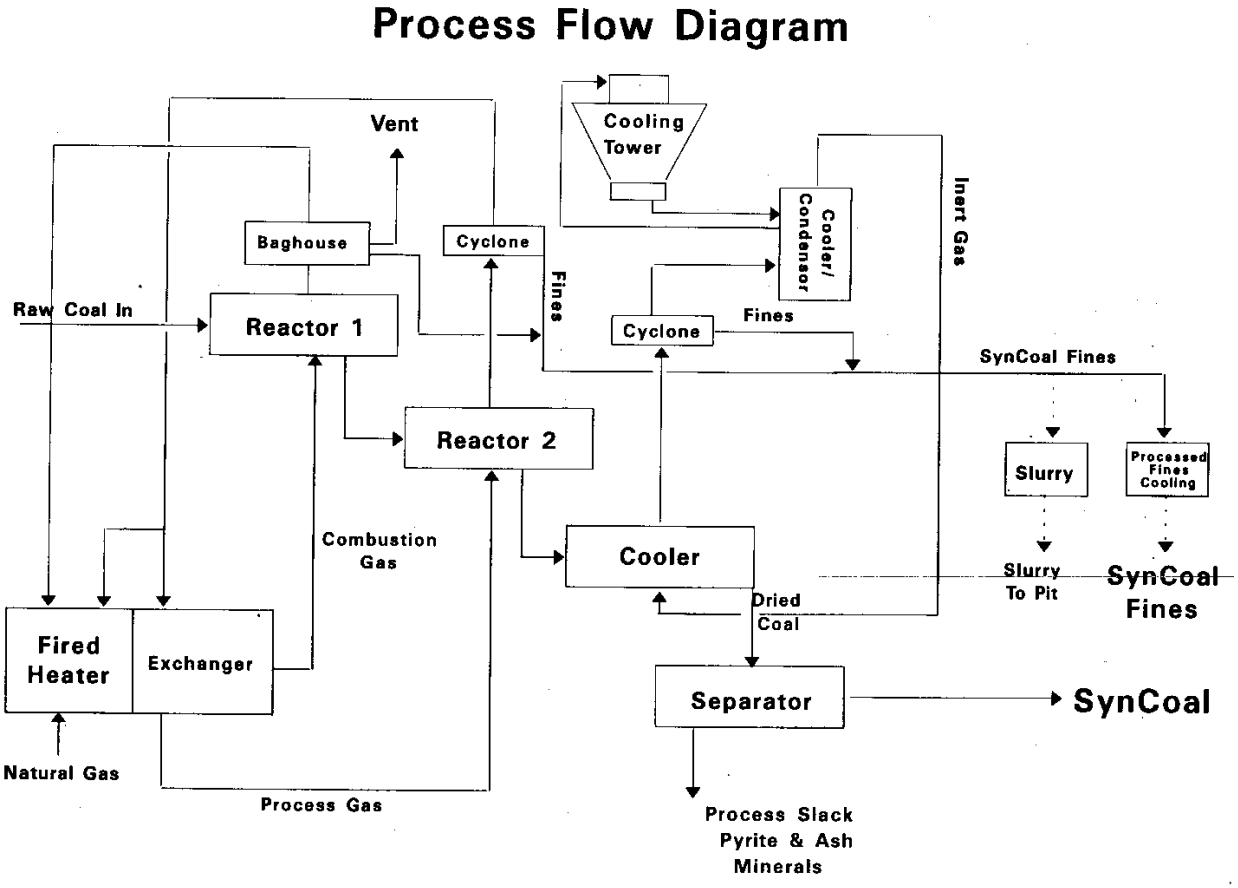
There are three major steps to the SynCoal® process: (1) thermal treatment of the coal in an inert atmosphere, (2) inert gas cooling of the hot coal, and (3) removal of ash minerals. **See Flow Diagram**

(1) During the thermal treatment process, raw coal from the stockpile is screened and fed into a two-stage thermal processing system. In the first vibratory fluidized-bed reactor, surface water is removed from the coal by heating it with hot combustion gas. When the coal exits this reactor, its temperature is slightly higher than that required to evaporate water. The coal is further heated to nearly 300^{o} C (5^{o} F) in a second reactor to a temperature sufficient to remove pore water and prompting decarboxylation. Here, particle shrinkage causes fracturing, destroys moisture reaction sites, and separates out the coal ash minerals.

(2) The coal then enters the coal cooler, where it is cooled to less than 150°F by contact with an inert gas (carbon dioxide and nitrogen at less than 100°F) in a vibrating fluidized bed cooler.

(3) In the last stage -- the coal cleaning system -- cooled coal is fed to deep bed stratifiers where air velocity and vibration separate mineral matter from the coal with rough gravity separation. The low specific gravity fractions are sent to a product conveyor while heavier specific gravity fractions go to fluidized bed separators, for additional ash removal. Fines from various parts of the cleaning process are collected in baghouses and cyclones, cooled and made available as an additional product line.

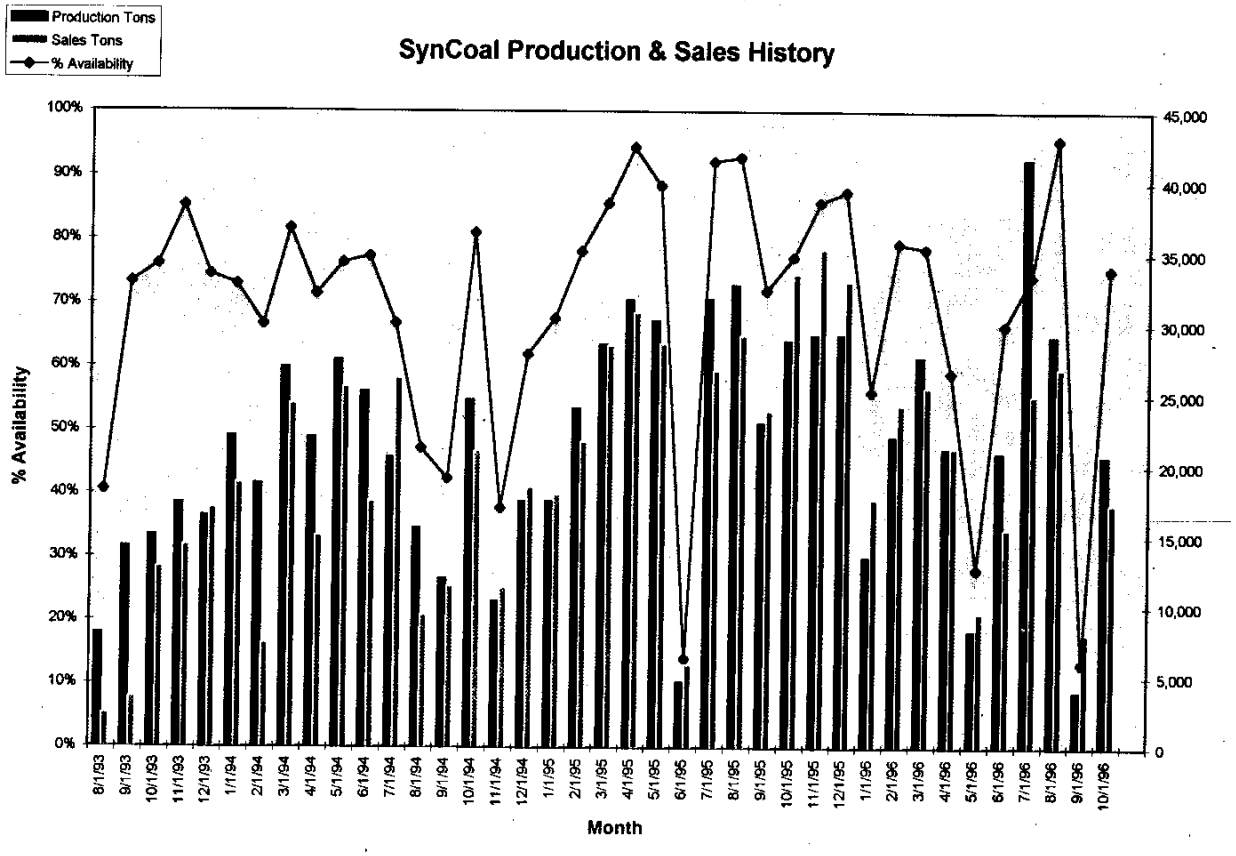
The SynCoal® is a high quality product with less than 5 percent moisture, sulfur content of 0.5 percent, ash content of about 9 percent, and a heating value of about 11,800 Btu per pound.



When operated continuously, the demonstration plant produces over 1,000 tons per day (up to 300,000 tons per year) of SynCoal® with a 2% moisture content, approximately 11,800 Btu/lb and less than 1.0 pound of SO_2 per million Btu . This product is obtained from Rosebud Mine sub-bituminous coal which starts with 25% moisture, 8,600 Btu/lb and approximately 1.6 pounds of SO_2 per million Btu.

Nearly 1.3 million tons of raw coal has been processed and over 850,000 tons of

SynCoal® has been produced through October 1996. The plant has consistently operated at over 100% of design capacity and over 75% availability. **See SynCoal Production and Sales History and Monthly Operating Statistics**



ACCP MONTHLY OPERATING STATISTICS

MONTH	PRODUCTION AVAILABILITY	FORCED OUTAGE RATE	TONS PROCESSED	CAPACITY FACTOR	SHIPMENTS
Mar-92	4%	96%	700	2%	181
Apr-92	7%	89%	411	1%	212
May-92	12%	76%	2,757	7%	0
Jun-92	13%	81%	2,496	7%	214
Jul-92	7%	56%	1,436	4%	0
Aug-92	17%	60%	1,860	5%	61
Sep-92	44%	33%	8,725	24%	1,672
Oct-92	13%	63%	2,292	6%	523
Nov-92	58%	28%	6,946	19%	2,386
Dec-92	11%	80%	1,063	3%	317
Jan-93	53%	26%	8,626	23%	3,658
Feb-93	44%	18%	6,544	19%	915
Mar-93	44%	34%	6,565	17%	629
Apr-93	49%	30%	8,514	23%	745
May-93	47%	39%	9,256	24%	768
Jun-93	15%	26%	2,752	7%	199
Jul-93	0%		0	0%	655
Aug-93	41%	43%	13,427	35%	2,361
Sep-93	73%	18%	23,276	63%	3,528
Oct-93	76%	11%	24,606	64%	12,753
Nov-93	85%	14%	27,927	76%	14,349
Dec-93	74%	9%	26,009	68%	16,951
Jan-94	73%	17%	34,979	92%	19,093
Feb-94	67%	28%	29,247	85%	7,909
Mar-94	82%	14%	41,891	10%	24,627
Apr-94	72%	27%	33,686	91%	15,622
May-94	76%	8%	39,404	103%	26,415
Jun-94	77%	23%	36,657	99%	18,873
Jul-94	67%	33%	34,026	89%	26,527
Aug-94	47%	19%	24,645	64%	9,146
Sep-94	42%	35%	20,327	55%	11,408
Oct-94	81%	16%	34,908	91%	19,161
Nov-94	38%	62%	16,418	44%	11,169
Dec-94	62%	27%	25,258	66%	18,478
Jan-95	68%	32%	31,726	83%	17,695
Feb-95	78%	22%	38,325	111%	21,710
Mar-95	86%	4%	42,674	112%	28,548
Apr-95	94%	1%	47,818	129%	30,827

MONTH	PRODUCTION AVAILABILITY	FORCED OUTAGE RATE	TONS PROCESSED	CAPACITY FACTOR	SHIPMENTS
May-95	88%	5%	43,752	114%	28,674
Jun-95	14%	26%	7,142	19%	5,859
Jul-95	92%	8%	48,512	127%	26,795
Aug-95	93%	4%	48,889	128%	29,261
Sep-95	72%	28%	37,129	100%	23,954
Oct-95	77%	10%	43,316	113%	33,614
Nov-95	86%	14%	42,807	116%	35,380
Dec-95	88%	13%	47,531	124%	33,101
Jan-96	56%	44%	24,710	65%	17,662
Feb-96	79%	21%	36,280	101%	24,340
Mar-96	79%	21%	39,071	104%	25,566
Apr-96	59%	19%	30,038	81%	21,321
May-96	28%	11%	13,282	35%	9,571
Jun-96	67%	21%	31,775	85%	15,553
Jul-96	74%	26%	35,056	92%	24,998
Aug-96	96%	4%	43,832	117%	29,200
Sept-96	13%	33%	6,117	16%	8,112
Oct-96	75%	25%	33,730	90%	17,375
	TOTAL		1,331,146		780,621

Utility Applications - Customer Results

A SynCoal® test-burn was completed at the 160 MW. J.E. Corette plant in Billings, Montana. A total of 204,478 tons of SynCoal® was burned between mid 1992 and April, 1996. The testing involved both handling and combustion of SynCoal® in a variety of blends. These blends ranged from approximately 15% SynCoal® to approximately 85% SynCoal®. Overall the results indicated that a 50% DSE SynCoal®/raw coal blend provided improved results with SO_2 emissions reduced by 21% overall, generation increased at normal operating loads and no noticeable impact on NOx emissions. DSE is a treatment to improve SynCoal®'s bulk handling characteristics when using conventional handling techniques. It controls dusting of the product and provides temporary resistance to spontaneous combustion.

Additionally SynCoal® deslagged the boiler at full load eliminating costly ash shedding operations and provided reduced gas flow resistance in the boiler and convection passage, reducing fan horsepower and improving heat transfer in the boiler area, resulting in increased generation by approximately 3 megawatts on a net basis.

Deliveries of SynCoal® are now being sent to Colstrip Project Units 1 & 2 in Colstrip, Montana. Testing has begun on the use of SynCoal® in these twin 320-megawatt pulverized coal fired plants. The results of these tests will provide information on: boiler efficiency, output, and air emissions. A total of 61,339 tons have been consumed to date.

A new SynCoal® delivery system is being designed which, if installed, would provide selectively controlled pneumatic delivery of SynCoal® to pulverizers individual pulverizers in the two units. This system would allow controlled tests in the two units providing valuable test data on emissions, performance and slagging. The use of both units operating at similar loads and with the same raw coal would provide a unique opportunity to perform directly comparative testing.

In May 1993, 190 tons of Center, North Dakota lignite was processed at the ACCP demonstration facility in Colstrip, producing 10,740 Btu/lb product and 47% reduction in sulfur and a 7% percent reduction in ash. In September 1993, a second test was performed processing 532 tons of lignite, producing a 10,567 Btu/lb product with a 48% sulfur reduction and a 27% ash reduction. The Center lignite before beneficiation had 36% moisture, approximately 6,800 Btu/lb at about 3.0 lbs of SO_2 per million Btu.

Approximately 190 tons of these upgraded products produced in September was returned two days later to the Milton R. Young Unit #1 and burned in an initial test showing dramatic improvement in cyclone combustion, improved slag tapping and a 13% reduction in boiler air flow, reducing the auxiliary power loads on the forced draft and induced draft fans. Additionally the boiler efficiency increased from 82% to in excess of 86% and the total gross heat rate improved by 123 Btu/kWh hour.

The operation of the cyclone units at the Milton R. Young facility are plagued by cyclone barrel slagging which is typically removed by burning additional No. 2 fuel oil. These units also slag and foul in the boiler and convective passes requiring complete shutdown and cold boiler washing between three and four times a year.

In an effort to reduce these detrimental effects, Minnkota Power has tested the use of SynCoal® as a substitute for fuel oil when removing cyclone slag and also as a steady additive to reduce the boiler slagging and convective fouling to reduce the number of cold boiler washings necessary. The fuel oil substitute testing nicknamed "Klinker Killer" has been successfully tested showing the SynCoal® is at least as effective in removing cyclone barrel clinkers on a Btu for Btu basis as fuel oil. The SynCoal® produces a much higher temperature in the cyclone barrel than lignite increasing the cyclone barrel front wall temperature as much as 900º F and more closely matched the design temperature profile which improves the cyclone combustion operation dramatically.

The testing to support the long term objective has indicated that SynCoal® would be effective in this application although the limited duration of these tests has left them less than fully conclusive.

Industry Applications - Customer Results

Several industrial cement and lime plants have been customers of SynCoal® for an extended period of time. A total of 129,056 tons have been delivered to these customers from 1993 through October 1996. In their testing and use of SynCoal® they

have found that it improves their production from their direct fired kiln applications. These improvements are both in capacity and product quality as the steady flame produced by SynCoal® appears to allow tighter process control and process optimization in their operations.

A bentonite producer has been using SynCoal® as an additive in their green sand molding product for use in the foundry industry. The bentonite company has used SynCoal® since 1993 and has taken approximately 30,569 tons. SynCoal® has been found to be a very consistent product allowing their customers to reduce the quantity of additives used and improving the quality of the metal casting produced.

Commercialization

Western SynCoal Company has moved closer to building a $37.5 million commercial SynCoal plant at Minnkota's Milton R. Young Power Station near Center, North Dakota. Minnkota is a generation and transmission cooperative supplying wholesale electricity to 12 rural electric cooperatives in eastern North Dakota and northwestern Minnesota.

Minnkota owns and operates the 250-megawatt Unit 1 at the Young Station, and operates the 438-mw Unit 2 which is owned by Square Butte Electric Cooperative of Grand Forks. This power station is already one of the lowest cost electric generating plants in the nation; however, with the use of SynCoal® the operations of the plant could further improve.

The SynCoal plant would produce an estimated 403,000 tons of finished product annually, which would be blended with the lignite. The reduced slagging and fouling improves generating plant maintenance and allows potentially longer runs between downtimes to ultimately produce more electricity. The process is anticipated to boost the lignite heating value by 60 percent and could lower its sulfur content by 50 percent with an anticipated second phase of the project.

International

RSCP has been actively marketing and promoting the SynCoal® technology world-wide. RSCP has been working closely with a Japanese equipment and technology company to expand into Asian markets. Prospects are also being pursued in Europe currently.

Summary

Rosebud SynCoal is continuing to advance the SynCoal® technology in a prudent and organized manner. The work to date has made SynCoal® the most advanced Low Rank Coal upgrading technology available and has put it on the cusp of commercial viability. The successful conclusion of the Center SynCoal Project and the enhanced SynCoal® delivery system and testing in Colstrip will position SynCoal® to be a viable option to enhance low rank coal fired utility operations.